

Appl. No. 09/970,723
Response dated April 7, 2004
Reply to Notice of Non-Compliant Amendment mailed 3/17/04

IN THE CLAIMS

Please enter the following amendments to the claims.

Claims 1-18 (cancelled)

19. (currently amended) A method of plating comprising:

providing an aqueous electroplating composition, comprising:

copper;

at least one acid, selected from sulfuric, methane sulfonic, amidosulfuric, aminoacetic, fluoboric, and mixtures thereof;

at least one halogen ion;

~~at least one additive, selected from an accelerating agent, a suppressing agent, and an suppressing-accelerating agent~~ a combination of additives comprising a suppressing agent and an accelerating-suppressing agent; and

the solution and mixture products thereof;

contacting a substrate with the plating composition; and

impressing a multi-step direct-current waveform potential upon the substrate,

wherein the multi-step direct current waveform potential comprises a stepped changing current density.

20. (original) The method of plating according to claim 19, wherein impressing a multi-step direct-current waveform potential upon the substrate further comprises:

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applying a direct-current waveform potential upon the aqueous electroplating composition before contacting the substrate therewith.

21. (original) The method of plating according to claim 19, wherein the method further comprises:

pre-treating the substrate with a composition selected from deionized water, distilled water, an acid, a base, a solvent, a reducing agent, and mixtures thereof.

22. (original) The method of plating according to claim 19, wherein the contacting the substrate comprises rotating the substrate relative to the plating composition at a rate in a range from about 0 to about 500 rpm.

23. (original) The method of plating according to claim 19, wherein contacting the substrate comprises supplying plating composition at a rate from about 3 L/min to about 60 L/min.

24. (original) The method of plating according to claim 19, wherein the plating composition is maintained in a temperature range from about 7 C to about 35 C.

25. (original) The method of plating according to claim 19, wherein the multi-step direct current waveform potential comprises a stepped changing current density that comprises: a nucleation current density; followed by

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an initiation current density; followed by
at least one cycle of a fill current density that comprises a first forward pulse
current density and a second reverse pulse current density; and followed by
a bulk fill current density.

26. (original) The method of plating according to claim 19, wherein the multi-step
direct current waveform potential comprises a stepped increasing current density that comprises:
a nucleation current density in a range from about 3 mA/cm² to about 70 mA/cm².

27. (original) The method of plating according to claim 19, wherein the at least one
cycle of a fill current density that comprises a first forward pulse current density and a second
reverse pulse current density comprises cycles in the range from 1ns to about 1 min.

28. (original) The method of plating according to claim 19, before contacting a
substrate with the plating composition, the method further comprising:
forming a seed layer comprising copper upon the substrate, wherein forming a
seed layer is selected from physical vapor deposition and chemical vapor deposition.

Claims 29 – 32 (cancelled)

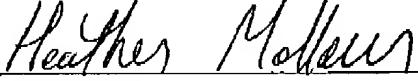
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If there are any additional charges, please charge Deposit Account No. 02-2666.

Respectfully submitted,

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Date: 4/7/ 2004


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